FORGING APOLLO'S GOLDEN BOW: LONG RANGE PRECISION FIRES IN FUTURE HIGH INTENSITY COMBAT

A MONOGRAPH
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ABSTRACT

Forging Apollo's Golden Bow:
Long-Range Precision Fires in Future High Intensity Conflict
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Throughout the history of warfare, there have been periods when technological developments have dramatically; albeit temporarily, affected the balance between firepower and maneuver on the tactical battlefield. Recent advances in information age technology have stimulated a renewal of the argument for an "ascendancy of fires." This idea envisions military forces that would rely primarily upon long-range precision fires to defeat an enemy before ground maneuver forces make contact. The military has entered a new period of dialogue focusing on the proper balance between firepower and maneuver. The time is right for the United States Army to reexamine these new capabilities and determine the optimum balance between firepower and maneuver for the ground force of the next century.

This monograph examines historical tactics and doctrine from World War I and the U.S. Army's Pentomic Era to determine why these previous attempts to rely primarily on firepower failed. The monograph then explores current concepts that seek to employ information age technology to enable long-range precision fires to destroy enemy forces while using maneuver forces to exploit firepower's success. A survey of potential vulnerabilities within this type of tactic assists in ascertaining the viability of an ascendancy of fires. Finally, this monograph determines if any of the historical reasons for failure of firepower ascendancy are still relevant for future information age, high intensity warfare.

This monograph concludes that emerging technology may indeed enable America's Army to effectively employ long-range precision fires. However, historical situations, wherein dominating firepower occurred without effective ground maneuver, indicate that firepower alone is insufficient to lead to decisive victory. Long-range precision fires could be an integral part of the Force XXI Army, but should not be the principle element. If economically feasible, the Army should continue to leverage emerging technology to improve the long-range fire support system. However, the U.S. Army should maintain its current balance of combat power in which firepower and maneuver complement one another on the battlefield.

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I. Introduction

"I believe we're at the threshold of major change for the combined arms team -- the ascendancy of fires." [1]

General Glenn K. Otis (Retired)

The U.S. Army's current field manual on operations defines maneuver as "the movement of combat forces to gain positional advantage, usually in order to deliver, or threaten delivery of, direct and indirect fire."[2] This same manual describes firepower as "the amount of fire that may be delivered by a position, unit or weapons system ... to destroy the enemy."[3] Throughout the history of warfare, there have been periods when technological developments have dramatically affected the balance between firepower and maneuver on the tactical battlefield. When the new technology enhanced the effectiveness of firepower, the forces with this firepower advantage tended to reexamine their military's doctrine and tactics to optimize the new technology. To this end, these military forces developed tactics that would focus on firepower over maneuver to gain battlefield victories.

Eventually, for a variety of reasons, these movements to exploit an apparent or actual dominance of fires proved to be short-lived. In this century, military forces have undergone at least two such periods: World War I and the U.S. Army's Pentomic Era immediately following the Korean War. Perhaps these attempts failed because the required conditions or capabilities were not yet present. Since our military is attempting to fully exploit emerging technology, the time may again be right for the United

States Army to reexamine the application of combat power incorporating these new capabilities.

Our current doctrine declares the necessity for maintaining a balance between firepower and maneuver. It states that "maneuver and firepower are inseparable and complementary dynamics of combat."[4] However, recent advances in information age technology have allowed a reemergence of the argument for the preeminence of fires over maneuver. One of the more vocal advocates of this argument, General (retired) Glenn K. Otis, describes this "ascendancy of fires" as a situation in which military forces would rely primarily upon long range precision munitions to defeat enemy forces before friendly ground maneuver forces make contact with them. Furthermore, General Otis believes that "we're evolving into the next stage of combined arms wherein fires become the centerpiece ... ground movement (tanks and infantry) support fires instead of vice versa."[5] Apparently, our military forces have entered another period of necessary dialogue focusing on the proper relationship between firepower and maneuver.

TRADOC Pamphlet 525-5 outlines the Army's concept for twenty-first century military operations. This pamphlet illustrates how America's Army could fight on the future battlefield using information age technology. This concept document articulates that, "the relationship between fire and maneuver may undergo a transformation as armies with high technology place increasing emphasis on simultaneous strikes throughout the

battlespace..."[6] The U.S. military is in a transition period during which critical decisions concerning tactics and doctrine must be made. Now is an excellent time to look closely at how the Army of the early twenty-first century will fight at the tactical level and determine whether these proposed concepts should indeed become doctrine.

This monograph will explore these potential tactics of the future by first examining historical examples of the ascension of firepower over maneuver. It will then illustrate the capabilities and principles of operations necessary to justify a paradigm shift wherein our future tactics would depend primarily on long range precision fires to win in battle. Additionally, it will examine what a future enemy military could do to counter successful application of these tactics. While only actual combat will be able to settle this debate, at least temporarily, this is a watershed period in our military evolution. A formal examination of the role of long range precision fires in America's Force XXI Army is relevant to this emerging doctrinal discussion.

II. Historical Perspective

"Warfare is the greatest affair of state, the basis of life and death, the Way to survival or extinction. It must be thoroughly pondered and analyzed."[7]

Sun Tzu

World War I

At the outset of the Great War, the spirit of the offense pervaded the tactical planning of all of the belligerents. However, by the time the Schlieffen Plan became bogged down in the fields of France, it had become clear that this was to be a war dominated by the defense. For a while, the western allies and Germans continued to attempt traditional maneuver warfare to gain a tactical advantage. Yet, as both sides repeatedly tried to attack the existing open flank of the trenches, the forces collided and ended up in a new stretch of trench line, until eventually there were no more flanks. Both sides had determined quickly that the only way to survive was to go below ground.[8]

This continuous front meant that the only type of maneuver form available was a frontal attack that relied on the increased firepower of massed artillery to penetrate the enemy's trench line.[9] However, these tactics tended to be ineffective and costly to the soldiers involved. Field Marshall Sir William Robertson, Chief of the General Staff of the British Expeditionary Force, succinctly described the problem with these tactics:

> The main lessons of these attacks are that, given adequate artillery preparation ... there is no insuperable difficulty in overwhelming the enemy's troops in the front line and in support, but that there is the greatest difficulty in defeating the

> enemy's reserves which have not been subjected to the strain of a long bombardment ...[10]

He understood that offensive operations needed to attack the opposing forces in depth if they were to succeed. While the tacticians on both sides grappled with this issue, another technique was being developed in the hope of restoring maneuver to the battlefield.

By 1916, the creeping or rolling barrage emerged. It called for a wall of artillery fires to move just ahead of the advancing infantry and then lift at regular intervals to allow the troops to move forward.[11] The "object of the artillery barrage [was] to prevent the enemy from manning his parapets and installing his machine guns in time to arrest [the] infantry."[12] A 1917 U.S. Army War College publication entitled *Artillery in Offensive Operations* clearly addresses the precision required for this tactic. It states that "the barrage must be sufficiently heavy to keep the enemy in his dugouts and sufficiently accurate to allow the infantry to get close to the trench [being] attacked."[13] The intent of this technique was to destroy or neutralize the enemy forces until the infantry could close within direct fire range for their assault. However, this technique proved to have an unintended effect.

Instead of facilitating a return to maneuver warfare, it caused the infantry to rely too much on the artillery. For a while, all the participants in this war "became increasingly addicted to the powerful drug of more and more artillery, and the guns came to dominate the battlefield as never before

in history."[14] As both sides came to depend on their heavy howitzers, it naturally became more important to improve counterbattery operations to destroy the enemy guns. Indeed, this rose to such importance that some viewed counterbattery action as the "essential mission of the artillery and the enemy gun [as] the most redoubtable adversary."[15] To successfully execute this mission, artillerymen needed to improve their deep fire capabilities in several key areas: detection and observation of the deep enemy batteries, communications between the observer and the commander of the guns, and the accuracy and responsiveness of the guns themselves.

Technology provided the answer to the detection problem when the British successfully used the airplane in this capacity. The aerial observer actually did more than just detect the enemy. He also communicated with the guns, watched the impact of the rounds and gave corrections to the firing battery.[16] However, a major limiting factor to the success of aerial observation was poor visibility caused by bad weather or smoke on the battlefield. Additionally, the guns became dependent on these aerial observers so much that when "bad visibility prevented any such calls being received, the gunners felt as though their eyes had been put out."[17] Despite these problems, aerial observation had become the most effective method for detecting enemy targets deep behind the front line of troops.

While the airplane provided an answer to the observer dilemma, it quickly became clear to commanders that these new artillery tactics

"depended above all other considerations on good communications between guns, commanders and observers."[18] Communication by wire had proved to be unreliable during this war, since enemy artillery impacts tended to cut the necessary wires regardless of the depth to which they were buried. Again, technology became available to resolve the problem in the form of new "wireless" communications. Very rapidly, reports from aircraft using wireless became an essential element in artillery programs.[19] Indeed, by 1917

> as 90 percent of counter-battery observation was done by airmen using wireless, the success of the artillery battle had come to depend on the weather being suitable for flying, on wireless reception and on a network of telephone lines from the receivers to the users of the airmen's information.[20]

Even though wireless communication was the answer to this requirement, it generated problems of its own. This new capability was vulnerable to enemy eavesdropping, interception, and jamming. A relatively simple answer emerged when both sides began to encrypt their radio transmissions. The radio had arrived as an integral part of fire support communication on the battlefield.

While the communication between the observer and the guns was the critical element if the deep fires were to succeed, the fire mission would still fail if the guns could not deliver rapid and accurate fires on the target. Field artillery notes gathered at the U.S. Army War College in 1917 emphasized this point.

> We must be able to open up concentrated fire with extreme rapidity ... a function of the speed with which everything is done

> in putting the power of artillery in operation: a) the celerity with which all of the information reaches the headquarters of the artillery group, b) quickness in preparation of the orders relating to these actions, c) speed in opening fire, which requires absolute control of the batteries ...[21]

The accuracy of the fires depended on two critical variables: the correct locations of the enemy and of the firing battery on the map. If either of these were incorrect, the rounds would not hit the target. Earlier in the war, the guns had fired registration rounds from which they could adjust; however, this alerted the enemy to incoming artillery and surprise was lost. The solution to this problem was the artillery survey, which was a method of fixing and recording the relative direction and distance of two points in three dimensions. The purpose of this survey was to develop an artillery map from which the bearings and distances from guns to targets could be measured accurately. This was essential for indirect fires when the target was only reported as a location on a map.[22]

Some 1917 Artillery notes from Ft. Leavenworth indicate another advantage gained by surveying, in that

> concentration of fires is as important now as ever, but this concentration of fire is not always obtained with the concentration of the guns ... the improvements in appliances for indirect laying, with increased range of the guns, allow fire to be concentrated upon a given point, while the guns actually delivering fire occupy widely separated positions.[23]

Ground forces were now capable of massing the effects of firepower without physically massing the weapons systems. Furthermore, this ability

to disperse the guns reduced their vulnerability to enemy counterbattery fires.

By the end of this great war, the improvements in the delivery of indirect fires were significant. Armies were capable of delivering accurate long-range indirect fires to destroy or neutralize enemy forces throughout the depth of the battlefield. However, this overwhelming volume of artillery fire alone was not decisive.

The military and civilian leaders of both sides struggled with various tactics to overcome the superior firepower and to break the bloody stalemate. Yet, all of these solutions had been based on firepower, specifically indirect artillery fires. Indeed, Colonel Georg Bruchmueller of the German army admitted that, although massed artillery had served the Germans well, they eventually viewed firepower as the problem itself.[24] Mobility, in conjunction with firepower, was necessary to successfully conduct the offensive operations that are critical to victory.

It would take another technological breakthrough to give the armies a viable method of taking the offensive and effectively maneuvering against the enemy. In 1916, "the tank clanked suddenly onto the battlefield and into the nightmares of every infantryman."[25] While the first use of the tank in combat was not truly successful, it provided a glimpse of the next generation of technology that could respond to counter the dominance of firepower. In November 1917, nearly 400 British tanks attacked the German defenses of

Cambrai. After initial success, German counterattacks negated most of the gains won by the British. However, "the tank attack at Cambrai cannot be measured by the raw statistics of yards gained or lost. It marked the start of a revolution in warfare ... the tank restored decisive power [of maneuver] to the offensive."[26]

The brief ascendancy of firepower in World War I had ended. The combatants had tried focusing artillery firepower at the point of penetration to open a hole in the enemy defenses. This failed because the enemy forces could merely array forces in depth, then employ reserves to prevent the attackers from exploiting the effects of firepower. Later, they used artillery fires on deep missions in an attempt to defeat enemy forces, primarily other artillery batteries, in the enemy rear. Advancements in observation, communication and precision of the firing guns contributed to the success of these missions. However, ground forces could still not move forward to occupy ground or defeat the enemy in close combat. Artillery fires were not successful in defeating the enemy forces. Indeed, the effects of artillery fires often prevented rapid movement. The guns destroyed much equipment and killed many soldiers, but they did not produce victory. When this improved firepower was married again to maneuver, with the tank and the airplane, offensive operations were once again able to drive back the defenders.

The Pentomic Era

Nearly thirty years later, the introduction of atomic weapons onto the battlefield revolutionized the nature of land warfare. By the 1950's, this dramatic leap in weapons capability had sparked another period in which military forces turned to firepower as the cornerstone of offensive operations.

United States Defense policy under President Eisenhower was based on the strategy of massive retaliation with nuclear weapons. This "New Look" would redefine the role of each service by focusing more on the specific requirements of the atomic age and the decreasing availability of defense dollars.[27] The Army quickly found itself relegated to a lesser role in the national defense and was forced to adapt to this emerging technological change in order to remain relevant on the future battlefield. Army leaders realized that they must explore the tactical potential of nuclear munitions if the Army was to remain a viable ground combat force.

The 1951 Army field manual *Tactical Use of Atomic Weapons* recognized the dramatic impact of this weapon by stating that "atomic missiles provide the commander with the most powerful destructive force yet brought to the battlefield. Proper integration of atomic fires with the maneuver of major forces will have a tremendous effect on the course of battle."[28] The unique destructive power of the atomic weapon generated a great deal of discussion about the relationship between firepower and maneuver, particularly in military journals. The Army realized that a

dramatic change had occurred in the military environment because of atomic technology and began to think and write about aspects of ground combat operations on the future atomic battlefield.[29] One article in *Military Review*, entitled "Through the Atomic Looking Glass," reflected the growing opinion of that time by stating that, "the outcome of wars down through the centuries have been governed by firepower or maneuver ... we may expect the next war to be one in which firepower will play the predominant role."[30] Senior Army leaders also believed that the development of tactical nuclear weapons had changed the balance between firepower and maneuver. Indeed, General Willard G. Wyman, then Commanding General of the U.S. Continental Army Command, went even farther by declaring in 1958 that "tactical firepower alone can accomplish the purpose of maneuver."[31] While most Army officers did not envision this extreme change, by the late 1950's many had come to believe that tactical nuclear weapons would be decisive in future conflict.[32]

The Army understood the need to incorporate nuclear weapons into its doctrine to reflect the change in tactics for the atomic battlefield. While the growing opinion in the Army indicated a general belief in the subordination of maneuver to nuclear fires, the 1954 Army Operations Manual (FM 100-5) maintained that "the planning and execution of offensive operations will continue to be based on the integration of fire and maneuver."[33] Yet, it did hint at the ascending importance of firepower by declaring that, "decisive results are obtained when a maneuvering force promptly exploits the

destruction and psychological effects of atomic weapons."[34] However, some officers did not believe that doctrine was taking full advantage of the potential of tactical nuclear weapons. The article "Nuclear Firepower and the Maneuver Force" that appeared in a 1961 *Military Review* argued strongly that:

> Maneuver must be subordinate to nuclear firepower. The age-old doctrine of firepower in support of maneuver needs to be reversed. Our doctrine should require that the commander base his operational planning on the use of his nuclear firepower. The maneuver plan must be designed to capitalize on this firepower. If tactical nuclear weapons are used, our doctrine should be maneuver in support of nuclear firepower.[35]

When the Army leaders incorporated their doctrinal principles into emerging tactical concepts for future nuclear combat, they envisioned maneuver forces as supporting nuclear firepower. Army leaders examined how best to employ maneuver forces to optimize the firepower of nuclear weapons and concluded that the nuclear battlefield would make flanking maneuvers irrelevant. The 1954 Army Field Service Regulations addressed this by noting that "the greater destructive power [of atomic weapons] will facilitate maneuver which otherwise might not be possible ... the use of atomic weapons may make the penetration a more acceptable form of maneuver."[36] Most tacticians agreed with this assessment because they felt that atomic weapons would allow a unit to blow a hole in the enemy defenses that armored ground forces could quickly exploit.[37] The 1951 Army Field Manual 100-31 *Tactical Use of Atomic Weapons* emphasized this point by

noting that "the greatest benefit from tactical use of atomic missiles may derive from rapid exploitation rather than the primary effects of the explosion itself."[38] The doctrine looked upon firepower as setting the conditions for the maneuver forces. Since it was assumed that nuclear weapons would definitely be used in a future conflict, the ability of ground forces to maneuver was based doctrinally upon the anticipated effects of atomic firepower.

Army leaders heralded this new offensive doctrine as revolutionary. Yet, those officers who had served on the western front during World War I may have quickly seen the similarities with the failed approach they had followed through four years of deadlocked trench warfare.[39] This "new" doctrine also placed "a stubborn faith in the ability of fires to shatter prepared defenses; [and] a belief that preliminary bombardments reduced the attacker's role to securing by rapid, controlled advances the gain that fires had made possible."[40] Once again, some military thinkers had apparently become enamored with the idea that more firepower was the answer to victory on the battlefield. By either disregarding or not understanding the lessons from World War I, they did not yet realize that these firepower based tactics could fail for many of the same reasons. In a way, they had arrived at a revised version of Marshal Petain's dictum from World War I by believing that "A-bombs capture the terrain and ground forces have only to occupy it."[41]

Yet, Army doctrine held that "the offensive is still based on properly combining firepower with maneuver. Atomic missiles are not absolute weapons, but rather powerful new weapons which must be properly integrated into tactical operations."[42] Elements of Army doctrine continued to state that maneuver was still necessary for battlefield victory; however, it was clear that in the tactical application of this doctrine, emphasis was placed upon firepower, specifically atomic firepower, to enable the ground forces to defeat the enemy.

If ground tactics were to rely on firepower, it was apparent to Army leaders that the targeting process for atomic fires was critical. The Field Manual *Tactical Use of Atomic Weapons* addressed this specific issue.

> The flow of target information must be accelerated if atomic missiles are to be employed effectively ... the effectiveness of atomic missiles in tactical operations will be measured in a large degree by the speed with which remunerative targets are identified, analyzed and attacked.[43]

The Army attempted to address these requirements by developing electronic and other types of sensory devices to acquire enemy forces for nuclear targeting. However, technological capabilities of that era were limited in range by factors such as terrain, fog, snow, haze, and ground clutter.[44] It became clear that target acquisition, especially when seeking deep targets, could only be accomplished with aerial reconnaissance platforms. In an attempt to speed the flow of surveillance information, doctrine urged that "reconnaissance aircraft should be immediately available

to the commander having authority to use atomic missiles tactically."[45] Unfortunately, the existing air and ground organizations had serious problems meeting the coordination requirements for faster processing of both visual and photographic reports of potential targets.[46]

Another key concern in this process was the ability to employ nuclear weapons rapidly after identifying a potential target. Civilian and military leaders acknowledged that nuclear munitions were clumsy battlefield weapons that could create excessive destruction. As a result, response time could prove to be slow because of the requirement for political approval for nuclear release.[47] Even if the President approved the use of nuclear weapons, a key issue among military leaders was the level of command that should have the authority to fire atomic missions. Army doctrine stressed that "overcentralization of control of fire support may lead to delays in delivery of fire, thus reducing its effectiveness."[48] However, the requirement for thorough integration of atomic munitions into the overall war plan made it likely that the authority to fire nuclear weapons would not be delegated lower than the level of the corps commander.[49] This in itself was not a problem, since nuclear capable artillery was a Field Army level weapon. Yet, retention of this authority at high level undermined the requirement for speedy evaluation and transmission of all relevant reconnaissance and intelligence information. This would impact directly upon the time lag between deciding upon a target for atomic munitions and the time the

mission is fired.[50] When the entire scheme of maneuver depended upon the destruction of enemy forces with atomic firepower, offensive actions could not begin until these missions were fired.

Overall, concern over the effectiveness of this firepower-based doctrine at the tactical level focused on two critical areas. First, since intelligence of deep enemy positions was likely to be poor, the maneuver forces could be vulnerable to reserves deployed in depth that, once committed, could be too close to friendly forces to use nuclear munitions. Second, the necessity of centralizing control of nuclear weapons with corps commanders or higher merely amplified the slow response time of nuclear fires. Even accurate target information could be useless if the process of approving the target, communicating to the firing unit, and delivering the munitions was too slow. Thus, much like problems encountered in World War I, the inability to efficiently acquire targets in depth and the reaction speed required to engage these targets with fire may have hindered the effectiveness of these tactics.

Since the Army never tested these tactics in actual combat, it is difficult to assess conclusively whether they would have succeeded. However, the U.S. military had the capability to employ these tactics in both Korea and Vietnam. Perhaps the fact that these tactics were never used in these conflicts lends credence to the argument that a ground maneuver plan based upon the firepower of atomic munitions was flawed. Indeed, military and civilian experts doubted whether a nation could employ tactical atomic

weapons without eventually causing an escalation to strategic nuclear weapons that targeted cities and industrial areas.[51] Since this was clearly a possibility, tactical victories achieved with nuclear weapons could have led to strategic defeat. Ultimately, the Army's reliance on nuclear firepower at the tactical level was shelved as a result of a change in political strategy. With the change of presidents in 1961, U.S. national security strategy shifted to a policy of Flexible Response. As a result, "the Army abandoned its 1950's initiatives with almost unseemly haste."[52] This marked the end to the "Pentomic Era" for the United States Army. The intense but brief flirtation with atomic firepower as the doctrinal centerpiece for ground warfare had proved to be unsuccessful.

III. <u>Into the Twenty-First Century</u>

"Victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after the changes occur."[53]

Giulio Douhet

America's Army now finds itself in the midst of another major technological change that will dramatically alter future warfare. This change is proceeding at an unprecedented rate as information processing impacts on virtually all aspects of life. Moreover, the nearly instantaneous sharing of information dramatically affects how the changing nature of decision processes impacts on military forces.[54] As the most modern military forces of the world leave the industrial age behind and enter what is being called the information age, the United States Army recognizes that it must

take full advantage of this emerging technology to remain the world's most formidable ground combat force. The 1994 issue of *Army Focus* articulates the logic underlying what has become Force XXI. The leadership of the Army realizes that, "none of us can predict exactly where the information age will take us ... if the Army is to remain relevant as an instrument of national power, it must embrace it and grow with it."[55] Once again, the United States Army is reexamining its tactical concepts to respond to rapid advances in technology.

As the Army looks to the future and examines how to optimize this information age technology, another dialogue has blossomed concerning the proper role of firepower. A strong supporter of an increased emphasis on firepower, retired Army General Glenn K. Otis, argues for the use of long-range fires "as the spearhead of the attack to the extent that the ground maneuver forces may only need to mop up after the fires."[56] Clearly, this is a dramatically different concept of operations than what is found in current or emerging Army doctrine. General Otis believes that there are two reasons why the Army should explore this potential ascendancy of fires.

> One is that we have superior capability to locate the enemy forces with precision. The second is that we have now and are further developing artillery, precision munitions and associated systems to such an extent that we can devote more of our battlefield efforts to raining accurate — highly accurate — volumes of fire on the enemy.[57]

For these reasons, he envisions destroying the enemy forces in depth on the battlefield with precision indirect fires, then using ground maneuver forces to exploit the effects of the fires. Speaking at the 1996 Senior Fire Support Conference, Major General Randall Rigby echoed this idea by stating that, "the objective of the fire support system is to reduce the enemy's capability to the point that when maneuver forces are committed, they're in the exploitation phase."[58]

Future concept writers understand that all the elements of combat power, including firepower and maneuver, are necessary for victory in battle. However, they acknowledge that the enormous advances in technology "may drive a reassessment of the traditional relationship between fire and maneuver."[59] Military planners realize that "the power of the microprocessor has provided a tool with which to integrate military operations to an unprecedented degree."[60] TRADOC Pamphlet 525-5 illustrates this view of the future by predicting that

> Firepower of forces operating throughout the depth of battlespace will include both direct and, in the future, indirect precision fires. Both must overmatch enemy capabilities in range, target acquisition, accuracy, and lethal punch. Improved locating devices and digitized sensor-to-shooter linkages will greatly improve the accuracy and responsiveness of close fire support systems.[61]

However, the previous historical perspective illustrates how the Army has failed before to optimize technology successfully and execute doctrine that relied predominantly on firepower. Before precious time and resources

are wasted again, it is important to determine whether conditions and capabilities have changed sufficiently to enable a successful paradigm shift to ground tactics that emphasize long-range firepower.

One approach to this is via the Army Chief of Staff's modernization objectives. The five areas of focus in this effort are to: dominate maneuver, conduct precision strike, protect the force, win the information war, and project and sustain the force.[62] To explore the potentials within each of these areas as efficiently and economically as possible, the Army created the Battle Labs program in May 1992. The Depth and Simultaneous Attack Battle Lab at Fort Sill, Oklahoma, is responsible for the precision strike modernization objective. To accomplish its mission, this Battle Lab will focus on

> defining requirements to detect and identify enemy forces throughout the depth of the battlefield; conveying that information in near real-time from the sensors to engagement systems; and, conducting unilateral and joint precision strikes to defeat them.[63]

The Army Science and Technology Master Plan, based on the senior leadership's vision of the future Army, is another method for focusing the effort on the five modernization objectives. This plan, updated annually, identifies major technological advancements that merit closer study by the Battle Labs. Of particular note is its emphasis on real-time targeting as critical to the success of long-range precision strikes. It defines this concept as "the ability to see the enemy in real-time at long-range, and share this critical information instantly with global connectivity."[64] This plan further

states that real-time targeting is divided into three processes: detection, decision making, and dissemination. Moreover, it highlights that these processes do not need to occur sequentially but may instead overlap.

> Detection includes the capability to survey the battlefield, search for predetermined targets, and gather sufficient data to enable confirmation of a target's identity prior to attacking it. Decision making involves defining target priorities, identifying engagement areas, allocating sensors, specifying trigger events, allocating munitions, and determining the means of attack and the method of control (centralized or decentralized). Finally, the information must be disseminated rapidly from collector to shooter with a minimum of handling in order to increase responsiveness.[65]

Thus, the required capabilities under study by the Army today are not very different from those pursued during World War I and the Pentomic Era. However, the emerging technology of the information age may now allow military forces to satisfy these requirements.

Recently the Army published TRADOC Pamphlet 525-66 to identify the operational capability requirements (OCR) necessary to fulfill the vision of future warfighting expressed in the Army's modernization objectives. The Depth and Simultaneous Attack Battle Lab is accountable for OCRs that will focus the effort in precision strike.[66]

Within these capability requirements, three specifically focus on the area of target acquisition. The first, real-time location and identification of targets, acknowledges that "current sensor capabilities that attempt to classify and locate targets are inadequate." It further states that "deep

attack systems must have real-time sensor data that provides sufficient detail in location and identification of targets ..." The second requirement focuses on the need for "increased dwell-time capabilities to search areas of interest." The third calls for sensors with "day/night, all weather, all terrain capability that provides accurate location and identification of targets ..."[67] The challenge now is for the Army to leverage existing and emerging information age technology to develop systems that can meet these requirements.

The Army does this through Advanced Technology Demonstrations (ATD) that demonstrate the potential for enhanced military operational capability and cost effectiveness in a real and synthetic operational environment.[68] There are at least two ongoing ATDs that are seeking to meet these three sensor capability requirements. The first is called STARLOS, an acronym for Synthetic Aperture Radar Target Recognition and Location System. The goal of this ATD is to "demonstrate the feasibility of identifying and locating high value targets from an aerial platform such as a UAV [unmanned aerial vehicle] in support of the Deep Attack Mission."[69] Results of this ATD conducted in a simulation environment found that

> the targets are located with great precision by a Synthetic Aperture Radar (SAR), and positively identified with a high probability by a real-time Automatic Target Recognition system ... the STARLOS system has the capability to provide precision targeting information to a designated weapon for attack and destruction.[70]

A second ATD will focus on the use of UAVs to provide long range target acquisition capability. The Hunter Sensor Suite ATD "will demonstrate a low observable advanced long range sensor suite with ATR [automatic target recognition], image compression, and secure communications to provide multiple target acquisition and precision targeting hand-off."[71] Thus, a survivable UAV, equipped with advanced concept technology, offers tremendous promise as a platform to ultimately satisfy the target acquisition operational capability requirements.

The area of sensor-to-shooter communications is addressed in two OCRs in TRADOC Pamphlet 525-66. One calls for a "robust streamlined multi-node processing system ... to facilitate rapid decision making [and] improve shooter responsiveness."[72] A second requirement focuses on artificial intelligence decision aids to streamline coordination and planning operations that will support deep strikes.[73] This is a critical link in the precision strike process. Even with perfect intelligence, if the information cannot get to the shooter quickly, the target may be gone by the time the mission is fired.

Advanced digital communications systems could provide the solution to the need for rapid, near real-time communications from the sensor to the shooter. An area that shows promise is the use of a digital quick fire channel. The artillery community has identified two potential means of establishing digital quick-fire channels.

> One is a link directly from [digital] appliqué to AFATDS [advanced Field Artillery tactical data system] selectively

> eliminating fire support nodes ... the other link is to establish parameters in the advanced Field Artillery tactical data system to speed up fire mission processing. Regardless of the link established, the digital quick-fire channel would be used to process fire missions for specific targets for specific purposes.[74]

However, this increase in responsiveness comes at the expense of the information management function that helps to clear fires. Previous fire support systems required a human interface at each node in the fire mission thread. That is, the call for fire stopped at each node and forced a human decision maker to act on the request before it could continue. The AFATDS design helps to streamline this procedure and speed up the response time. AFATDS allows the ground commander "to establish parameters (target values, priority of fires, etc.) that automate the processing of a request-for-fire from the sensor to the shooter ..."[75] These parameters can provide a degree of information management for clearing requests for fires. While AFATDS is not a fully automated decision maker, it does significantly improve the processing time required to approve a call for fire from the sensor and then send that mission to the appropriate long range shooter.

Two critical capability requirements address the final piece of precision strike, the ability to deliver accurate and timely long range fires. The first OCR recognizes that "future deep attack munitions must include greater reliance upon smart and brilliant munitions and sub-munitions."[76] The second requirement notes that, "future systems must provide for extended ranges allowing the attack of targets at great depth ... to conduct

precision strikes ..."[77] Additionally, if the Army is to rely on long range precision fires, a capability must exist to engage and kill the target even if it continues to move.

The Army's potential answer to these requirements is the Army Tactical Missiles System (ATACMS) with the Brilliant Anti-Tank (BAT) submunition. The ATACMS Block II will be an "inertial guided, global positioning system aided, ground-launched, surface-to-surface missile containing 13 BAT submunitions ... [that] are anti-armor, top-attack submunitions with acoustic and infrared seekers working in tandem."[78] The block II missile will deliver its BAT submunitions to a predetermined aerial point and disperse the submunitions. The submunitions will then search within a target area of approximately one square kilometer and then destroy any acquired target.[79] When the Army fields this improved system in 2001, its range of up to 140 kilometers will give the Army ground-based deep strike capability. This precision strike weapon system, while very capable, is also very expensive. The FY97 Defense Budget appropriates funds to purchase 97 ATACMS missiles at a total cost of $92.8 million; nearly one million dollars per missile.[80] In an era of constrained budgets, this could impact on the number of missiles available for future conflict.

If the BAT is to be an effective submunition, the time lapse from target acquisition to target impact must be short. One reason for this is that "the capability to accurately predict the target velocity, variance in speed and (or)

change in direction all contribute to the total targeting uncertainty."[81] So, with a reduced sensor-to-shooter timeline, the location can be current enough for the smart munitions to acquire and destroy even a moving target.

In an attempt to synchronize and integrate all of these concepts, the Army is currently gathering information from a program called the Joint Precision Strike Demonstration (JPSD). The JPSD mission is to "improve and demonstrate a joint adverse weather, day and night, end-to-end, sensor-to-shooter precision strike capability to locate, identify and eliminate high-value, time sensitive targets and assess damage within tactically meaningful timelines."[82] This program employs a realistic test environment that should provide enough substantive data to help determine if the paradigm shift is feasible for the U.S. Army. If this demonstration successfully completes the mission, it will illustrate that long-range precision fires are capable of destroying enemy targets and formations before they can close within direct fire range of friendly ground forces.

The JPSD office is conducting a series of experiments that will fully test the capability of current and future technology that will enable the Army to execute precision strikes. In November 1993, the Beyond Line-of-Sight (LOS) Unmanned Aerial Vehicle Demonstration proved that "commanding and controlling a UAV and its sensor via satellite link and relaying the sensor video data via satellite link is a viable solution to a beyond LOS capability to conduct surveillance, target acquisition and combat

assessment."[83] The UAV definitely offers significant capabilities to the ground commander to acquire targets in support of precision fire missions.

In November 1994, the JPSD Surface-to-Surface Demonstration examined the Extended Range Army Tactical Missiles System in precision strike missions against time critical, deep targets. The highlight of this demonstration was "the detection and attack of a high value target in less than 10 minutes."[84] These Advanced Concept Technology Demonstrations show that emerging technology will soon make the necessary individual capabilities available. What remained to be tested was the ability to integrate all of these capabilities together in a realistic combat environment.

The Precision/Rapid Counter-Multiple Rocket Launch (MRL) CONUS Demonstration seeks "to develop and demonstrate an Army adverse weather, day/night, sensor-to-shooter, precision deep strike capability ... [to be] achieved by leveraging and integrating current, emerging and advanced technologies and resources."[85] While this October 1995 ACTD focuses on targeting a MRL threat, it is useful as an evaluation tool since it must synchronize the requirements in the functional areas of surveillance, target acquisition, strike planning, weapons delivery, and combat assessment.[86] The objectives of this ACTD focus primarily on demonstrating potential capabilities and alternative tactics, techniques and procedures. In order to fully examine unrestricted potential for emerging concept technology, this

JPSD did not actively seek to determine the effects of possible countermeasures.

This demonstration used three Army systems for target acquisition. The Improved Firefinder Radar system (AN/TPQ-37) provided a reactive system that could detect and locate artillery and rockets and provide their launch point coordinates to permit rapid engagement with counterfire. This system incorporates a digital and wire interface with the Tactical Fire Direction System.[87] The second system was the Predator medium altitude endurance UAV. This UAV is capable of providing synthetic aperture radar coverage deep into the battlefield at altitudes between 15,000 and 30,000 feet and can remain on station for 24 hours.[88] This ability to acquire targets from higher altitudes helps this UAV be more survivable in a hostile air defense environment.[89] The STARLOS was flown live on a surrogate aircraft for this demonstration, while a Predator was equipped with STARLOS only in simulation. The third sensor, the HUNTER UAV, was equipped with the RISTA II (reconnaissance, intelligence, surveillance, target acquisition) system that is a 2nd generation infrared sensor. This sensor is capable of viewing ten square kilometers and includes Aided Target Recognition capabilities that facilitate its ability to rapidly process detected target images for dissemination to the ground station.[90]

This demonstration also evaluated several new concepts to improve the sensor-to-shooter timelines. A Common Ground Station, located in a Corps

TOC, provided the capability to "acquire, integrate, and disseminate UAV video, 2nd Generation FLIR, Joint Surveillance Target Attack Radar System (JSTARS), Moving Target Indicator, synthetic aperture radar, and secondary National Imagery Transmission Format."[91] This enabled Corps planners and decision makers to receive integrated intelligence on a single work station in real time from all available sensors. The Automated Deep Operations Coordination System (ADOCS), located in the fire support cell was digitally connected to the Common Ground Station. This connectivity allowed the ADOCS to experiment with the Automated Weapon Target Pairing (AWTP) software as the third element attempting to improve sensor-to-shooter timelines. The AWTP prototype software receives the mission and automatically selects and notifies the MLRS platoon to fire on that target -- in less than one second. Furthermore, this software gives the commander the capability to set in possible parameters, such as range limitations, that further allow the system to perform automatic target discrimination.[92]

The Army Multiple Launch Rocket System (MLRS) delivered some of the munitions used in this demonstration. Of particular note are the Extended Range Guided MLRS and the Preplanned Product Improved (P3I) BAT. The Extended Range Guided MLRS can fire out to a range of 60 kilometers with an improved accuracy of less than 3 mil in bearing drift that enables it to be used for point target attack. It contains an inertial guidance system that allows it to release 409 Dual Purpose Improved Conventional

Munitions (DPICM) on a precise target location for precision kill capability.[93] The BAT P3I, inside an ATACMS, uses acoustics, millimeter wave and imaging infrared seekers with a target set that includes cold stationary armor, moving armor, and surface-to-surface missile launchers. It also includes a selectable warhead that can be switched to hard or soft target mode before impact.[94] Because these munitions are still in development, existing MLRS launchers dry fired on live targets while the concept munitions were delivered in simulation to evaluate target effects.

This ACTD focused on MRLs employing one of two tactics. In the first scenario, the MRLs would return to their bunker style caves after firing. In the case two scenario, the MRLs would move to alternate firing positions and form artillery groups instead of returning to the caves. Each case was demonstrated over a six day cycle; however, the advanced technology and future concepts were used only during the final two days of each cycle.[95] At the beginning of the exercise scenario, the UAVs were up and orbiting and the Enhanced Firefinders were sighted to observe the target areas as determined by the Intelligence Preparation of the Battlefield (IPB) process. Once the UAV located a target, this information was relayed digitally to the Common Ground Sensor. This sensor digitally communicated this information to the ADOCS which then transmitted the mission to the MLRS firing platoon for execution.

The number of targets destroyed is a critical indicator of the effectiveness of the precision strike. The targets for this demonstration consisted of 108 MRLs and 108 170mm guns. In scenario number one, in which only the MRLs returned to the caves, the BATs were only able to kill 10 of the MRLs because they were exposed for a period of time that was too short for the BATs to arrive and attack the target.[96] However, the BAT smart munitions accounted for 78 target kills on the 170mm guns that continued to move from one firing position to another. In scenario number two, in which all targets continued to move to alternate positions without returning to the caves, the smart munitions were much more effective. In this scenario, MLRS submunitions killed 102 of the MRLs and 95 of the 170mm guns.[97] In each scenario, the artillery smart munitions and guided DPICM ended the battle by H+3.[98] Thus, the smart munitions were very effective against moving or stationary targets in relatively open terrain; however, the effectiveness was severely degraded when potential targets were in heavily fortified defensive positions.

Overall, the JPSD office gleaned several useful insights from this ACTD. The live and simulated UAVs proved that they are capable of providing a major new source of targeting and intelligence data. Also, the enhanced firefinder was very effective and offers a significant opportunity for counterfire missions. Additionally, the MLRS equipped with smart submunitions provides a significant increase in target lethality.[99] The

evidence suggests that this demonstration took a major step forward in examining the ability of emerging technology to provide rapid fire mission execution from sensor-to-shooter.

In recent testimony before Congress, the Assistant Secretary of the Army, Gilbert F. Decker, summarizes the requirements necessary to conduct precision strikes.

> In order to conduct synchronized, decisive operations, the Army must strike and destroy enemy forces throughout the battlefield ... to accomplish this the Army must have modern artillery, attack helicopters, missile systems with adequate range and firepower, effective munitions, and superb Reconnaissance, Surveillance, and Target Acquisition systems among which are included reconnaissance helicopters and a family of modern UAVs. The munitions suite must include munitions that defeat fixed targets and moving vehicles as well as munitions that can engage and destroy high priority, short dwell targets ...[100]

The results from the Battle Labs and the ACDTs to date indicate that technology that will be available in just a few years will enable the Army to effectively execute decisive precision strike missions.

By using simulations and experimentation, the Army that is looking forward into the twenty-first century is attempting to overcome historical obstacles to firepower based tactics. These simulated battlefield environments allow researchers to integrate live and virtual capabilities and actually examine overall effectiveness. This research process started by examining the desired endstate -- required capabilities of the future to enable effective long range precision strike tactics. These capabilities centered on

target acquisition in depth, digital communication from the sensor to the shooter via a decision maker, and finally on delivering precision guided munitions on long range targets.

Advanced Concept Technology Demonstrations have proven that information age technology will allow the U.S. Army to achieve each the requisite capabilities within each area. Unmanned Aerial Vehicles equipped with advanced sensors are now able to provide long dwell, all weather surveillance deep into the battlefield. Digital communications architecture, while not yet mature, has shown that sensors in the future will be able to transmit targeting information to the decision maker in only seconds. The ATACMS Block II program with brilliant submunitions will provide incredibly precise long range fires. Perhaps most importantly, the Joint Precision Strike Demonstration program is focusing on seemlessly integrating these individual functions into a successful battlefield system.

Over 150 years ago, Clausewitz wrote that, "war... is not the action of a living force upon a lifeless mass ...but always the collision of two living forces."[101] With this in mind, it is critical to examine potential weaknesses or vulnerabilities of this tactic that a future adversary might exploit if America's Army of the next century relies on long range precision fires. Futurists Alvin and Heidi Toffler believe that information age, or Third Wave, weaponry will readily spread throughout the world. While many countries cannot afford to equip their military forces completely with

information age technology, some critical elements are affordable. In short, the Tofflers argue that "adding commercially available Third Wave 'smarts' to old, Second Wave [industrial age] weapons can tranform them into intelligent weapons at peanut prices that even impoverished armies can afford."[102] As a result, they predict that "today's smart armies will find themselves faced by tomorrow's smartened armies."[103] If this occurs, the most likely scenario would become one in which the U.S. Army must fight an enemy with some advanced information age capabilities. Thus, to assess fully the viability of firepower-based tactics in to the early part of the twenty-first century, military leaders must consider potential technological countermeasures or tactical capabilities such an opponent may use against U.S. forces.

Russian military thinkers have continued to examine tactics that would allow their future military forces to win against an enemy equipped with advanced long range precision munitions.[104] Interestingly, the Russian leaders decided tentatively to place an even greater emphasis on tactical maneuver as a partial remedy to counter high precision weapons. They realized that the advantage could sway to the force that could close quickly with the enemy and render long range high precision weapons less effective. Small, highly mobile maneuver forces would be instrumental in tactics directed at closing rapidly into enemy rear areas to help defeat enemy long range weapons systems.[105] Thus, despite a potential future ascendancy of

long range precision fires, Russian tacticians would use the speed of maneuver to overcome the range and precision advantage of information age firepower. While the Russians are not an eminent adversary, other militaries can study or adopt these ideas on tactics in the future. Thus. maneuver based tactics could be employed effectively to defeat a military force that relies on long range precision fires to achieve victory.

Another area concerns potential countermeasures that could defeat critical components of the long range targeting process. Three general capabilities that enable us to employ effective long range precision fires may be vulnerable to enemy countermeasures. To sucessfully execute firepower-based tactics, it is necessary to acquire targets, communicate digitally from the sensor to shooter, and rapidly employ precision munitions. If the enemy can defeat or disrupt any one of these functional areas, these tactics could fail. Indeed, specific counters are already emerging throughout the world that could limit the critical operational capabilities required by the U.S. Army's precision strike systems.

In *The Future of Land Warfare* (1987), Christopher Bellamy foresaw that "modern technology could give fortification a new lease [on] life."[106] He argued that large scale use of sophisticated precision munitions could quickly impose a recurring form on a conflict ... similar to that of World War I. Bellamy concludes that if this was to happen, a return to maneuver might again be necessary to break a defensive deadlock.[107] His vision of the future

battlefield could easily prove to be true. Indeed. the recent Joint Precision Strike Demonstration illustrated that both current and concept precision munitions have difficulty against strongly fortified defensive positions.

An adversary could adopt a defensive posture and heavily fortify critical assets to negate a U.S. firepower advantage. This technique would be less effective if this opponent had positive aims and sought to conquer territory. Yet, fortifications could enable their ground forces to survive the precision strikes until they were ready to initiate offensive operations. Overall, fortifications are clearly more effective for an opponent in a defensive posture. However, since U.S. Army doctrine emphasizes offensive operations, fortifications may be a feasible option for potential enemies in the future to counter precision strike weapon systems.

Electronic countermeasures are another option available to exploit potential weaknesses in precision targeting. The impact of the electro-magnetic pulse generated by a nuclear weapon on communications equipment is well documented. The Army has known that "research into nonnuclear EMP [electro-magnetic pulse] was ongoing before the collapse of the Soviet Union ... [and that] if fielded, it would have a decided impact on the information battle."[108] Thus, even in a future non-nuclear conflict, this type of countermeasure could interfere with the critical digital information and communications links between battlefield sensors and the long range precision shooters. This countermeasure would have a greater impact on

more sophisticated military forces, such as those of the United States, that rely more heavily on information age technology to execute their tactical plan.

Another technique that may become important in the future is the use of electro-optical counter measures, primarily in the area of lasers. Laser beams can be deceived easily since they only operate within limited frequency bands. Deceptive techniques are currently under study that would measure the laser's wavelength and pulse repetition frequency and then use that information to illuminate a false decoy target that would attract the projectile.[109] Any precision guided munition that relies on a laser designator for its accuracy could be vulnerable to this type of countermeasure.

Finally, target acquisition equipment, such as the UAV, could be vulnerable to enemy countermeasures. These aerial platforms, although smaller than manned aircraft, can still be intercepted and destroyed by ground based air defense systems. Additionally, enemy forces can use deception to reduce the effectiveness of these target acquisition sensors. However, Richard Simpkin, in *Race to the Swift* (1985), pointed out that

> as surveillance techniques advance, the cost and effort of physical deception will come to approach those of the real thing. The days of empty camouflage nets, wooden guns and rubber tanks are, one feels, past. The only way to be sure of success ... will be to deploy real formations in a deception role.[110]

This is particularly true as emerging technology allows military forces to gather and confirm targeting information from multiple sources.

Deception may not be as easy in the future; yet, if accomplished, could prove to be more effective if an army wastes precious PGMs on false targets.

Overall, a technologically equipped opponent of America's Force XXI Army in a future conflict has several options available to attempt to defeat firepower-based tactics. These options focus either on tactics or targeting specific aspects of a precision strike targeting system. An enemy ground force could attempt to rely on rapid maneuver by forward detachments to close within direct fire range and thus render long range fires ineffective. Another tactic available is to assume a defensive posture and heavily fortify critical assets or ground forces. Additionally, countermeasure techniques that focus on jamming or deceiving sensors or communications equipment could disrupt or defeat critical links in the targeting process. While these tactics or techniques will not guarantee defeat of a Force XXI ground force, they do illustrate potential vulnerabilities to address before changing to these tactics.

The capability to deliver long range precision fires effectively is achievable in the near future. Technology, either currently available or in concept development, may allow ground combat forces to destroy enemy forces before they are within range of direct fire weapons. Experimentation has demonstrated these capabilities. Yet, Army leaders also understand that America's ground forces do not fight alone. Other elements of the armed forces, such as helicopters or air and sea launched missiles, offer competing

and complementary alternatives to a joint force commander that requires a long range precision strike capability. However, the Battle Lab program has allowed the Army to determine which internal systems have this potential before allocating precious financial resources into procurement. With these concepts in hand, the Army may now be ready to move forward and explore tactics and doctrine that can optimize the potential of precision strikes.

IV. Conclusions

"Those who cannot remember the past are condemned to repeat it."[111]
George Santayana

The leadership of America's Army must understand that attempts to optimize technology on the battlefield are not new. History has shown that previous endeavors to use emerging technology to dominate the battlefield with firepower have ultimately failed. As a new generation of Army leaders strives to choose which concepts for future warfare to develop into tactical doctrine, these decision makers cannot afford to ignore lessons available from recent history.

The machine gun, large artillery pieces and emerging capabilities for rapid indirect fires in depth allowed firepower to completely dominate the western front in the early years of World War I; however, overwhelming firepower alone could not bring about victory on the battlefield. Tacticians in that war attempted to focus artillery at the point of penetration and merely use ground forces to exploit the effects of this firepower. Enemy forces

ultimately countered this tactic successfully by adopting new maneuver techniques, not by responding with greater firepower. The defender merely arrayed forces in depth or used reserves to rapidly reinforce the point of penetration to deny the attempted exploitation. Ultimately, it was the inability to effectively maneuver in conjunction with this overwhelming firepower that caused the stalemate in the fields of France. The return to a balanced tactical employment of firepower and maneuver eventually broke that stalemate and brought victory to the western allies.

During the Pentomic Era, nuclear weapons technology led the U.S. Army to rely on atomic firepower as the centerpiece of warfighting doctrine. Once again, ground forces envisioned using this massive firepower to create a penetration that maneuver forces could exploit. Technology employed in aerial platforms was improving the army's ability to rapidly acquire potential nuclear targets in depth. However, overcentralized control of nuclear fires created delays in the targeting process and slowed the critical response time between the sensor and the shooter. Furthermore, the potential presence of nuclear weapons on the battlefield increased the dispersion between maneuver forces. These dispersed forces could reduce the effectiveness of nuclear fires by closing rapidly with opposing ground forces to put both sides within the danger area of a nuclear blast. Thus, despite advances in technology required for dominating long range firepower, maneuver based

tactics again offered a method for reducing the overall effectiveness of firepower.

Information age technology has again generated a close look at concepts that would optimize emerging capabilities on the future battlefield. Proponents of an ascendancy of fires sound hauntingly similar to previous advocates of earlier firepower based tactics. As in both World War I and the Army of the Pentomic Era, arguments again advocate tactics in which maneuver forces merely exploit the effects of overwhelming firepower.

General Otis, an outspoken supporter of modern firepower, stresses that "the ascendancy of fires will demand highly accurate and timely knowledge of enemy locations through reconnaissance, surveillance and target acquisition and the ability to bring devastating fires to bear day, night or in bad weather or obscurations."[112] Indeed, results from the Battle Labs and the Advanced Concept Technology Demonstrations attest to the possibility that an Army with these capabilities could potentially employ effective long-range precision fires. However, these results do not yet indicate that these capabilities alone would be decisive in future high intensity conflicts. An army relying on long range precision fires could be vulnerable to enemy maneuver forces or countermeasures that target critical information and communication links in the fire support process.

Previous conflicts illustrate that overreliance on one aspect of combat power failed to bring victory. Doing so allowed enemy forces to employ

tactics or countermeasures that focused on defeating one piece of an adversary's combat capabilities. The United States Army should certainly continue to leverage all technology that contributes to decisive victory. However, part of the strength of a military's combat power lies in a balance of capabilities, not in a preponderance of one. Clearly, an "ascendancy of fires" implies a "descendancy of maneuver;" yet, history has proven that dominating firepower alone does not bring victory. Clausewitz understood this when noting that "an army composed simply of artillery ... would be absurd in war."[113] Firepower and maneuver must continue to complement one another for an army to win on the future battlefield.

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